

**UNIVERSITY OF MAINE AT FARMINGTON**

**COLLEGE OF EDUCATION, HEALTH AND REHABILITATION**

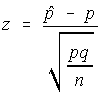
**LESSON PLAN FORMAT**

**Teacher’s Name:** Sarah Fredrick **Lesson #:** 4 **Facet:** Empathy and Self - Knowledge   
**Grade Level:** High School **Numbers of Days:** 3 - 4 days   
**Topic:** Real World Decision Making  
  
**PART I:**   
  
**Objectives**  
**Student will understand that**the probability distribution is everywhere in real life and that the expected value is related to the probability distribution.  
**Student will know**Definitions - [probability](http://www.dictionary.com/browse/probability), [expected value](http://www.investopedia.com/terms/e/expected-value.asp), [probability distribution](http://www.investopedia.com/terms/p/probabilitydistribution.asp), [random variable](https://en.wikipedia.org/wiki/Random_variable), [mean](https://en.wikipedia.org/wiki/Mean), [median](https://en.wikipedia.org/wiki/Median), [standard deviation](https://en.wikipedia.org/wiki/Standard_deviation), [standard error](http://www.investopedia.com/terms/s/standard-error.asp), Formulas - [expected value formula](http://statistics.about.com/od/Formulas/a/What-Is-The-Formula-For-Expected-Value.htm), [probability distribution formula](http://formulas.tutorvista.com/math/probability-distribution-formula.html), [z-value formula for means](http://www.statisticshowto.com/how-to-calculate-a-z-score/#zscoreformulas), [z-value formula for probability](https://people.richland.edu/james/lecture/m170/ch08-pro.html), Critical details - problem solving, [decision making](http://www.the-happy-manager.com/tips/steps-in-decision-making/)  
**Student will be able to**relate expected value to the probability distribution and recognize where the probability distribution appears in their everyday lives outside of the classroom  
**Product:**Prezi and Timeline  
  
**Maine Learning Results (MLR) or Common Core State Standards (CCSS) or Next Generation Science Standards (NGSS) Alignment**  
**Common Core State Standards**  
**Content Area**: Statistics and Probability  
**Grade Level**: High School  
**Domain**: Using Probability to Make Decisions  
**Cluster**: Calculate expected values and use them to solve problems  
**Standards**: 2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.  
4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.  
**Rationale:**The teacher will address both of these standards in the lesson by having students use the skills they have learned in the previous lessons and applying it to real world examples.   
  
  
**Assessments**  
**Formative (Assessment for Learning)**   
**Section I – checking for understanding strategy during instruction**  
Students will use 3-2-1 to evaluate how comfortable they are with the material. Students will also think about how well they know the material by playing four corners.  
**Section II – timely feedback for products (self, peer, teacher)**   
Students will look at a checklist when creating their timelines. The teacher will use the checklist to check their understanding of applying the material they learned to real life experiences. The teacher will give students written feedback on the checklist. Students will look at a rubric when creating their Prezi to make sure they have completed the task and have compared their experience to both the probability distribution and expected value. As the teacher I will use a rubric to check their understanding of applying their knowledge to real life situations and will give written feedback to the students in a comments section on the rubric  
**Summative (Assessment of Learning):**   
[Timeline](http://www.readwritethink.org/files/resources/interactives/timeline_2/): Students will make a timeline of times when the probability distribution has showed up in their lives outside of the classroom. Students will be expected to explain how it showed up in that time. 10 points  
[Prezi](https://prezi.com/welcome/#0): Students will get data on one of their real life experiences from their timeline. They will then relate that experience to the probability distribution and expected value, as well as other key information from the lesson and unit. Students will share their Prezi with the class. The Prezi must include pictures and graphs. They will also talk about how having the information may have changed the decision they made. If it wouldn't have changed their decision they must explain why. 40 points  
  
**Integration**  
**Technology (SAMR):**   
Timeline - This technology is at the augmentation level because students can name their timeline and drag the boxes where ever they need to. They can also add a full description of the event that they are adding to the timeline which will only show up in a printable version of the timeline.  
Prezi - This technology is at the augmentation level because students can choose a number of different formats and can add graphics and effects to their presentations.  
**Content Areas:**  
Art. Students will be required to include pictures in their Prezi. The pictures can be pictures they took or pictures they drew.  
  
**Groupings**  
**Section I - Graphic Organizer & Cooperative Learning used during instruction**  
Time order chart - students will fill in the time order chart to list times when the probability distribution appear outside of the classroom which will act as the story board for their timeline products. Mix- Pair- Share - students will share their events with their classmates. This will help students think more about when it appeared in their lives before they create their product. If they hear an event that one of their classmates shared and realize that the event occurred in their lives as well they can add it to their graphic organizer and to their product.  
**Section II – Groups and Roles for Product**  
Students will be working on their own for both products. For the time line project students will have the opportunity to share their events with their classmates during the cooperative learning activity which will be done in small groups.

**Differentiated Instruction**  
**MI Strategies**  
**Verbal:** Student will talk will the teacher when playing four corners. They will explain why they are in the corner they are in.  
**Logic:** Students will be getting data on one of their own experiences.  
**Visual:** Students will be including pictures and graphs in their Prezi  
**Kinesthetic:** Students will be moving around the classroom during the four corners activity.  
**Intrapersonal:** Students will be making a Prezi based on their own experience and will be evaluating their own work using a rubric.  
**Naturalist:** One of the examples from their lives outside of the classroom must be an example from nature.  
**Modifications/Accommodations**  
**From IEP’s ( Individual Education Plan), 504’s, ELLIDEP (English Language Learning Instructional Delivery Education Plan)**I will review student’s IEP, 504 or ELLIDEP and make appropriate modifications and accommodations.  
  
**Plan for accommodating absent students:**   
If you are absent, it is the student's responsibility to make up the assignments and/or tests when they return. All homework assignments are posted on my class website. This includes classes missed for field trips and sports events. It is the student's responsibility to come in at lunch or after school to catch up on missed work from their absences. You should get the notes that you missed from another student before meeting with me. If students are absent on the day of a test, they will be expected to make up the test on the next day that they are in school. There are exceptions for extended absences but the student must come see me the day they get back to school. If students miss either of the days that the projects are introduced they should see the teacher for instructions and for a possibly alternative assignment. If students miss the day the class is presenting the products, they will be asked to see the teacher for an alternate time to present. If a student is out for an extended period of time they need to see the teacher for possible alternative assignments.   
  
**Extensions**  
  
**Technology (SAMR): Gifted Students:**   
Timeline - This can be brought up to the modification level by allowing students to add pictures to their events on the timeline.   
Prezi - This can be brought up to modification by allowing students to publish their work. By doing this, anyone on Prezi can access their presentation and look at their work.   
  
**Materials, Resources and Technology**  
graphic organizers  
projector  
white board  
markers  
laptops for students  
rubric for Prezi  
checklist for timeline  
coins  
M&M's or skittles  
  
**Source for Lesson Plan and Research**  
<http://dictionary.reference.com/browse/probability> probability definition.  
<http://www.investopedia.com/terms/e/expected-value.asp> expected value definition  
<http://www.investopedia.com/terms/p/probabilitydistribution.asp> probability distribution definition  
<https://en.wikipedia.org/wiki/Random_variable> random variable definition  
<https://en.wikipedia.org/wiki/Mean> definition of mean  
<https://en.wikipedia.org/wiki/Median> definition of median  
<https://en.wikipedia.org/wiki/Standard_deviation> definition of standard deviation  
<http://www.investopedia.com/terms/s/standard-error.asp> definition of standard error  
<http://statistics.about.com/od/Formulas/a/What-Is-The-Formula-For-Expected-Value.htm> expected value formula  
<http://formulas.tutorvista.com/math/probability-distribution-formula.html> probability distribution formula  
<http://www.statisticshowto.com/how-to-calculate-a-z-score/#zscoreformulas> z - value formula for means  
<https://people.richland.edu/james/lecture/m170/ch08-pro.html> z- value formula for proportions  
<http://www.the-happy-manager.com/tips/steps-in-decision-making/> information about decision making.  
<http://www.readwritethink.org/files/resources/interactives/timeline_2/> students will use this website to make their timelines  
<https://prezi.com/welcome/#0>Prezi website  
[http://www.eduplace.com/graphic-organizer/pdf/timeorder.pdf](http://www.eduplace.com/graphicorganizer/pdf/timeorder.pdf) time order chart graphic organizer.  
<https://www.youtube.com/watch?v=FhOPWEBa1W4> The teacher will use this video as a hook into the lesson  
<https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf> teacher will use Mix Pair Share cooperative learning activity from this pdf.  
<https://www.engageny.org/sites/default/files/resource/attachments/checking-for-understanding-techniques.pdf> link to four corners checking for understanding strategy.  
<https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf> 3 - 2 - 1 checking for understanding strategy.  
<https://www.youtube.com/watch?v=ArGh6FurR0Q> tutorial for Prezi  
<https://prezi.com/support/> Prezi support  
<https://www.youtube.com/watch?v=56VASSQ_F2c> Timeline tutorial  
<http://www.readwritethink.org/classroom-resources/student-interactives/timeline-30007.html> Timeline tutorial and information  
<http://dealnews.com/features/The-Color-Mixture-in-an-M-Ms-Bag-Is-a-Precise-Science-and-Other-Candy-Facts/626727.html> this information will be used in the M&M activity in class.  
  
**PART II:**   
  
**Teaching and Learning Sequence**

**Classroom Arrangement**

The classroom will have three rows made up of two desks pushed together. The desks will be facing the board. There will be a table with lined paper and other supplies that the students may need for the lesson.

**Agenda**  
Day 1: Hook into Lesson 5 minutes  
Coin toss activity 15 minutes  
Discussion 5 minutes  
[3 - 2 -1 checking for understanding strategy](https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) 5 minutes  
Introduction into [Timeline](http://www.readwritethink.org/files/resources/interactives/timeline_2/) Product 10 minutes  
Time to work on [graphic organizer](http://www.eduplace.com/graphicorganizer/pdf/timeorder.pdf) 15 minutes  
[Mix - Pair - Share cooperative learning activity](https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf) 15 minutes  
Time to work on Product 10 minutes  
Assignment: Finish Timeline Product. Be ready to share with class next meeting.  
Day 2: Time to share Product with classmates 40 minutes  
[M & M activity](http://dealnews.com/features/The-Color-Mixture-in-an-M-Ms-Bag-Is-a-Precise-Science-and-Other-Candy-Facts/626727.html) 20 minutes  
[four corners](https://www.engageny.org/sites/default/files/resource/attachments/checking-for-understanding-techniques.pdf) 20 minutes  
Day 3: Introduction into[Prezi](https://prezi.com/welcome/#0) product 20 minutes  
[3 - 2 -1 checking for understanding](https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) 5 minutes  
Time for questions 5 minutes  
Time to work on Prezi 50 minutes  
Assignment: finish Prezi. Be ready to share with class next meeting  
Day 4: Presenting Prezi 80 minutes  
**Teaching and Learning Sequence**   
  
Student will understand that the probability distribution is everywhere in real life and that the expected value is related to the probability distribution. The standards that will be addressed in this lesson are 2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. 4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. The teacher will [hook](https://www.youtube.com/watch?v=FhOPWEBa1W4) students into the lesson by playing a video on [YouTube](https://www.youtube.com/watch?v=FhOPWEBa1W4) that gives examples of where probability and the probability distribution can be found in real life. This will hook students into the lesson because while watching it they will be thinking if they have done the example. Students will also be thinking about where they have seen it in their real lives.  
**Where, Why , What, Hook Tailors:** Visual, Logical, Intrapersonal  
  
Student will know [probability](http://www.dictionary.com/browse/probability), [expected value](http://www.investopedia.com/terms/e/expected-value.asp), [probability distribution](http://www.investopedia.com/terms/p/probabilitydistribution.asp), [random variable](https://en.wikipedia.org/wiki/Random_variable), [mean](https://en.wikipedia.org/wiki/Mean), [median](https://en.wikipedia.org/wiki/Median), [standard deviation](https://en.wikipedia.org/wiki/Standard_deviation), [standard error](http://www.investopedia.com/terms/s/standard-error.asp), [expected value formula](http://statistics.about.com/od/Formulas/a/What-Is-The-Formula-For-Expected-Value.htm), [probability distribution formula](http://formulas.tutorvista.com/math/probability-distribution-formula.html), [z-value formula for means](http://www.statisticshowto.com/how-to-calculate-a-z-score/#zscoreformulas),[z-value formula for probability](https://people.richland.edu/james/lecture/m170/ch08-pro.html), problem solving, [decision making](http://www.the-happy-manager.com/tips/steps-in-decision-making/) (see content notes). The students will be completing a [time order graphic organizer](http://www.eduplace.com/graphicorganizer/pdf/timeorder.pdf) during this lesson. The students will be filling out their graphic organizer by talking about details of where they have seen the probability distribution in their lives outside of the classroom. The [cooperative learning activity](https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf) that will be used in this lesson is [mix pair share](https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf). During this activity students will be discussing their experiences with the probability distribution with their classmates. The students will talk to a partner about one of the experiences they wrote down on their graphic organizer. The teacher will have the students stand up and start walking around the classroom silently. The teacher will then call pair and students will pair up. The teacher will make sure that everyone has a partner. The teacher will then ask the students to share one of their experiences that they wrote on their graphic organizers with their partner. The teacher will repeat this process until students have shared with a total of 5 other students. The teacher will use the [checking for understanding strategy 3 - 2 - 1](https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) two different times during this lesson. The first time is on the first day of the lesson after the students watch the [hook](https://www.youtube.com/watch?v=FhOPWEBa1W4) and participate in a coin toss activity. The teacher will use this to make sure that the students understand the hook and the coin toss activity. The teacher will ask the students to hold up their fingers depending on their level of understanding. Students will hold up 3 fingers if they completely understand the examples of real world probability and how the coin activity related to it. Students will hold up 2 fingers up if they understand the real world examples or if they understand how the coin toss activity can be a real life example. Students will only hold up 2 fingers if they understand one of these things not both. Students will hold up 1 finger if they don't understand either activity. If students hold up 2 fingers the teacher will ask them which one they don't understand and will make note of it this way the teacher can help the students later. If students only hold up 1 finger the teacher will also make a note of it so the teacher can talk with them later. The second time that this will be used in the lesson is on the third day after the teacher has introduced the [Prezi](https://prezi.com/welcome/#0) project that the students will be creating. The teacher will do this in order to ensure that the students understand the material that has been taught in the past lessons and that students are confident enough to complete this product. The teacher will ask students how well they understand the task that they have been given and if they feel like they know the material well enough to complete the product. The students will hold up 3 fingers if they understand the task they have been given and feel like they know the material well enough to complete the project. Students will hold up two fingers if they understand the project or if they feel like they know the material well enough. Students will only hold up two fingers if they either understand the task or if they understand the material, not both or neither. Students will hold up 1 finger if they are completely lost on what they are supposed to do and if they feel like they don't understand the material well enough to complete the project. The other checking for understanding strategy that the teacher will use in this lesson is [four corners](https://www.engageny.org/sites/default/files/resource/attachments/checking-for-understanding-techniques.pdf). The teacher is using this activity to make sure that students have mastered the material in the previous lessons because they will need it for the products in this lesson. The teacher will use this strategy after having students complete an [activity using M&M's](http://dealnews.com/features/The-Color-Mixture-in-an-M-Ms-Bag-Is-a-Precise-Science-and-Other-Candy-Facts/626727.html) and solving problems based on that activity. The teacher will have the students discuss the answer to the hypothesis tests by using [four corners](https://www.engageny.org/sites/default/files/resource/attachments/checking-for-understanding-techniques.pdf). The teacher will have four "answers" posted in each corner of the classroom. Students will then go to the appropriate corner for each test. The students will then explain why they went to that corner to the teacher and the rest of their classmates.  
**Equip, Explore, Rethink, Tailors:** Interpersonal, Intrapersonal, Verbal, Logical, Visual, Kinesthetic  
  
Student will be able to relate expected value to the probability distribution and recognize where the probability distribution appears in their everyday lives outside of the classroom. The first product that students will be creating is a [Timeline](http://www.readwritethink.org/files/resources/interactives/timeline_2/). Students will be working on their own for this project. Students will have the opportunity to share the events that they are including on their timeline with their peers when they play the [cooperative learning activity, Mix Pair Share](https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf). Students will be allowed to add events to their timelines based on events that their classmates talk about. The student will be able to self-assess this product by looking at a checklist that the teacher will provide. This will be the same checklist that the teacher uses to assess their product. The teacher will introduce the product by showing [tutorials](http://www.readwritethink.org/classroom-resources/student-interactives/timeline-30007.html) in the time set aside in class. During this time the teacher will be showing the students where they can find the tutorials on the teacher's website this way they can access it outside of class. The second product that the students will be creating is a [Prezi](https://prezi.com/welcome/#0). The students will be working on their own for this product. The teacher will introduce this project by showing tutorials in the class time that has been set aside to introduce the project. The students will self-assess this product by using a rubric that the teacher will give to them when introducing the project. This rubric will be the same rubric that the teacher uses to assess the students' products. Students will be allowed to refine both products after getting feedback from the teacher.  
**Experience, Revise, Refine, Tailors:** Verbal, Visual, Interpersonal, Intrapersonal, Logical  
  
The teacher will give feedback on both products. The teacher will use a checklist for the timeline project. The teacher will use the checklist to see if students have the important components in their products. The teacher will provide written feedback on the checklist so that students know why one of things wasn't checked off as well as written feedback that explains their grade. The teacher will fill out the checklist and given written feedback while the students are presenting their timelines and will give the feedback to the students at the end of class. The teacher will use a rubric to give students feedback on their Prezi. The teacher will provide written feedback on the rubric so that students know why they got the grade they received. The teacher will fill out the rubric as the students present their Prezi’s. The teacher will give the students the rubric with the written feedback at the end of class.   
**Evaluate, Tailors:** Intrapersonal, Visual, Verbal  
  
**Teacher Content Notes**  
Day 1: The teacher will start off the lesson by playing a [YouTube video](https://www.youtube.com/watch?v=FhOPWEBa1W4) that explains where probability can be found in real life. This will hook students into the lesson because while watching it they will be thinking if they have done the example. Students will also be thinking about where they have seen it in their real lives. The teacher will then give each student a quarter and have them flip the coin 20 times. The students will be asked to record how many times the quarter lands heads up. After all the students have flipped the coin 25 times, the teacher will collect the coins and ask the students to write the number of heads on the board. The teacher will use that information to create a probability distribution and find a z - score as well as use the information to conduct a hypothesis test. After this activity the teacher will lead an in class discussion on how they can use a coin toss in real life and what other examples students have of where they have seen probability in the real world. The teacher will then ask the students to [hold up their fingers](https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) depending on their level of understanding. Students will hold up 3 fingers if they completely understand the examples of real world probability and how the coin activity related to it. Students will hold up 2 fingers up if they understand the real world examples or if they understand how the coin toss activity can be a real life example. Students will only hold up 2 fingers if they understand one of these things not both. Students will hold up 1 finger if they don't understand either activity. If students hold up 2 fingers the teacher will ask them which one they don't understand and will make note of it this way the teacher can help the students later. If students only hold up 1 finger the teacher will also make a note of it so the teacher can talk with them later. The teacher will introduce the [Timeline](http://www.readwritethink.org/files/resources/interactives/timeline_2/) Project by telling students about the assignment and by showing students the website they will be using and by playing the [tutorials](http://www.readwritethink.org/classroom-resources/student-interactives/timeline-30007.html). The teacher will also hand out the checklist and will go over it will the class at this time. The teacher will then hand out the[graphic organizer](http://www.eduplace.com/graphicorganizer/pdf/timeorder.pdf) and ask the students to fill it out. Students will be asked to start brainstorming and writing down where they have seen the probability distribution in their lives outside of school. If students complete that they will be asked to write down information about each event on the graphic organizer. During this time the teacher will call students that held up 1 finger to talk to her so that she can help them get to the point where they feel they could hold up 2 or 3 fingers. If there is still time the teacher will call students that held up 2 fingers to come talk to her so she can get them to the point where they feel they could hold up 3 fingers. The students will then play [mix pair share](https://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf). The teacher will have the students stand up and start walking around the classroom silently. The teacher will then call pair and students will pair up. The teacher will make sure that everyone has a partner. The teacher will then ask the students to share one of their experiences that they wrote on their graphic organizers with their partner. The teacher will repeat this process until students have shared with a total of 5 other students. The last few minutes of class will be time for students to add events to their graphic organizers or to notes. These can be events that they heard their classmates say. They may also work on their final timeline during this time. The teacher will be available for help if students need it. The students’ assignment will be to finish their timeline and be ready to share it with the class the next time they meet.  
Day 2: The first half of class will be time for students to share their [timeline](http://www.readwritethink.org/files/resources/interactives/timeline_2/) products with their classmates. During this time the teacher will be giving students written feedback on their products using a checklist. The teacher will then simulate a real life experience using M&M's. Each student will be given a bag with 50 M &M's. Students will then count how many of each color M&M's they have and will find out the percentage. The teacher will then find an average percentage for each color using all the percentages the students found. The teacher will then show the students the percentages that M&M gives consumers and the students will compare that data to theirs and the classes. The students will then be given a couple hypothesis test problems that uses the percentages they found and the percentages that [M&M provided](http://dealnews.com/features/The-Color-Mixture-in-an-M-Ms-Bag-Is-a-Precise-Science-and-Other-Candy-Facts/626727.html). After the activity the teacher will check for understanding by using [four corners](https://www.engageny.org/sites/default/files/resource/attachments/checking-for-understanding-techniques.pdf). The teacher will have the students discuss the answer to the hypothesis tests by using four corners. The teacher will have four "answers" posted in each corner of the classroom. Students will then go to the appropriate corner for each test. The students will then explain why they went to that corner to the teacher and the rest of their classmates. The teacher will then go over the problem and walk through getting the answer. The teacher will do this for each hypothesis test problem.  
Day 3: In the beginning of class students will be introduced to the [Prezi](https://prezi.com/welcome/#0) product that they will be making. The teacher will show the [tutorials](https://prezi.com/support/) and help students sign up for an account and get a template for their project started. The teacher will hand out the rubrics that students will use to self-assess and that the teacher will use to give students feedback on their products and presentation. The teacher will then use the [3 - 2 - 1 checking for understanding activity.](https://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) The teacher will ask students how well they understand the task that they have been given and if they feel like they know the material well enough to complete the product. The students will hold up 3 fingers if they understand the task they have been given and feel like they know the material well enough to complete the project. Students will hold up two fingers if they understand the project or if they feel like they know the material well enough. Students will only hold up two fingers if they either understand the task or if they understand the material, not both or neither. Students will hold up 1 finger if they are completely lost on what they are supposed to do and if they feel like they don't understand the material well enough to complete the project. After this activity is over, the teacher will answer any questions that students have about the project or the material that they will need to complete the project. After the teacher answers the students' questions, the teacher will ask the students if they better understand the requirements of the project or if they understand the material better. If some students are still confused they will see the teacher for more help while everyone else is working on the product. The rest of the class will be time for the students to get the data they need to complete their projects and work on creating their Prezi’s. For the next class students will need to have their Prezi done and be ready to present it to the class.  
Day 4: This class period will be designated for presentations. The teacher will be giving feedback on the rubric while students are presenting their Prezi’s. Other students will be expected to be silent and respectful while their peers are presenting.  
  
**Handouts**  
Checklists  
graphic organizers  
rubrics  
  
**Maine Common Core Teaching Standards for Initial Teacher Certification and Rationale**  
  
**Standard 1 –Learner Development. The teacher understands how learners grow and develop,recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.**  
  
**Learning Styles**  
**Clipboard:** The teacher will hand out time order charts which will help students organize their thoughts and their experiences with the probability distribution. The graphic organizer will also greatly help students when it comes time to make their timeline.  
**Microscope:** Students will learn about their classmates’ experiences with the probability distribution during the cooperative learning activity. They will also learn more about the experiences that they made have had and just didn't think about when hearing where the probability distribution showed up in their classmates' lives.   
**Puppy:** The teacher will make sure that students feel safe in the classroom environment. The teacher will also make sure that students feel comfortable enough to be able to share the problems they created with their classmates without getting negative comments.   
**Beach Ball:** Students have the opportunity to show their creativity when making the timeline because they can add any event in their lives where the probability distribution showed up outside of the classroom. Students can also design their Prezi anyway that they want as long as it meets the criteria on the rubric.  
  
**Rationale:** It is important for the teacher to address all of these learning styles because in the classroom teachers will have students with each learning style and all the students need to be able to learn in a way that best suits them.   
  
**Standard 6 - Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their on growth,to monitor learner progress, and to guide the teacher's and learner's decision making.**  
  
**Formative:**  
3 - 2 - 1:Students will use 3-2-1 to evaluate how comfortable they are with the material and its applications to real life as well as how well they know the material and what is being asked of them in the product they are creating.  
Four Corners: students will be discussing the outcome of hypothesis tests by playing four corners.  
**Summative:**   
Timeline: Students will make a timeline of times when the probability distribution has showed up in their lives outside of the classroom. Students will be expected to explain how it showed up in that time. 10 points  
Prezi: Students will get data on one of their real life experiences from their timeline. They will then relate that experience to the probability distribution and expected value, as well as other key information from the lesson and unit. Students will share their Prezi with the class. The Prezi must include pictures and graphs. They will also talk about how having the information may have changed the decision they made. If it wouldn't have changed their decision they must explain why. 40 points  
**Rationale:**The teacher will use the 3 - 2- 1 strategy to see how well students can evaluate their knowledge. The teacher will also see who is still struggling with the material and who is confused about what the teacher is asking them to create and show in their products. The teacher is checking for understanding by using the four corners activity. The teacher is doing this by having students solve problems that are similar to problems they have solved in the past and having students go to a corner based on their answer. Students are then explaining to their classmates why they stood in the corner they did. The teacher is using this to also clear up any misunderstandings that the students may have by going over the problems. The teacher is using the timeline to make sure that students can use their knowledge of what they learned in the previous lessons and apply it to their lives outside of school. The teacher is checking to see if they students can research and find data on one of their lives experiences by using Prezi to present their findings.   
  
  
**Standard 7 - Planning Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum,cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.**  
  
**Content Knowledge:**  
Students will know [probability](http://dictionary.reference.com/browse/probability) - the possibility that an event will occur, [expected value](http://www.investopedia.com/terms/e/expected-value.asp) - the predicted value for a given event, [probability distribution](http://www.investopedia.com/terms/p/probabilitydistribution.asp) - describes all the possible values and their likelihood of occurring, [random variable](https://en.wikipedia.org/wiki/Random_variable) - a variable whose value is subject to variations due to chance, [mean](https://en.wikipedia.org/wiki/Mean) - used as a synonym for expected value, [median](https://en.wikipedia.org/wiki/Median) - the number that separates the higher half of the data sample from the lower half, [standard deviation](https://en.wikipedia.org/wiki/Standard_deviation) - the number that is used to describe how much the data varies from the mean, [standard error](http://www.investopedia.com/terms/s/standard-error.asp) - the standard deviation of the sampling distribution,[expected value formula](http://statistics.about.com/od/Formulas/a/What-Is-The-Formula-For-Expected-Value.htm) - E(X) = x1p1 + x2p2 + x3p3 + . . . + xnpn., [z-value formula for means](http://www.statisticshowto.com/how-to-calculate-a-z-score/#zscoreformulas) -**z = x – μ / σ**, [z-value formula for probability](https://people.richland.edu/james/lecture/m170/ch08-pro.html) -, [probability distribution formula](http://formulas.tutorvista.com/math/probability-distribution-formula.html) -Normal Probability Distribution,problem solving, [decision making](http://www.tutorialspoint.com/management_concepts/decision_making_process.htm)  
  
**MLR or CCSS or NGSS**  
**Common Core State Standards**  
**Content Area**: Statistics and Probability  
**Grade Level**: High School  
**Domain**: Using Probability to Make Decisions  
**Cluster**: Calculate expected values and use them to solve problems  
**Standards**: 2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.  
4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.  
**Facet:** Empathy and Self - Knowledge  
  
**Rationale:** The teacher will address both of these standards in the lesson by having students use the skills they have learned in the previous lessons and applying it to real world examples.  
  
**Standard 8 - Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.**  
  
**MI Strategies:**   
**Verbal:** Student will talk will the teacher when playing four corners. They will explain why they are in the corner they are in.  
**Logic:** Students will be getting data on one of their own experiences.  
**Visual:** Students will be including pictures and graphs in their Prezi  
**Kinesthetic:** Students will be moving around the classroom during the four corners activity.  
**Intrapersonal:** Students will be making a Prezi based on their own experience and will be evaluating their own work using a rubric.  
**Naturalist:** One of the examples from their lives outside of the classroom must be an example from nature.  
**SAMR:**   
Timeline - This technology is at the augmentation level because students can name their timeline and drag the boxes where ever they need to. They can also add a full description of the event that they are adding to the timeline which will only show up in a printable version of the timeline.  
Prezi - This technology is at the augmentation level because students can choose a number of different formats and can add graphics and effects to their presentations.  
**Rationale:**The MI's that are being used in this lesson are differentiating instruction because they are helping students with different learning styles be successful in this class. By satisfying multiple intelligences, the teacher is giving all students an equal opportunity to learn no matter what intelligence they learn best in. The Timeline is promoting higher order thinking because students are being asked to relate what they have been learning about in the lesson and the unit to their real world experiences outside of the class. The Prezi is promoting higher order thinking because it is asking students to find out more information and to find data on one of their real life experiences.  
  
***NETS STANDARDS FOR TEACHERS***  
**1. Facilitates and Inspire Student Learning and Creativity. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.**  
a. Promote, support, and model creative and innovative thinking and inventiveness  
  
b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources  
  
c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes  
  
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments  
  
***Rationale:*** a, b, c. The teacher will be addressing standard a and b by requiring students to think about their experiences and asking them to find data and make a presentation about it. Students will reflect on the products they have created by checking to see if they met the criteria on the checklist and rubric.  
  
**2. Design and Develop Digital Age Learning Experiences and Assessments. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop knowledge, skills, and attitudes identified in the NETS-S.**  
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity  
  
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress  
  
c. Customize and personalize learning activities to address students’ diverse learning styles, working strategies, and abilities using digital tools and resources  
  
d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching  
  
**Rationale:** a, c, d. Students will be using digital tools for their summative assessments in this lesson. The teacher will be using different learning styles throughout the lesson and in the products that students are creating.